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# A structural equation model relating oral condition, denture quality, chewing ability, satisfaction, and oral health-related quality of life in complete denture wearers

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ABSTRACT

*Objectives:* To investigate the relationship between mandibular ridge form, stability and retention of mandibular complete denture, accuracy of jaw relation recording, patients' perception of chewing ability, satisfaction with dentures and oral health-related quality of life (OHRQoL) in complete denture wearers.

*Methods:* A total of 183 edentulous patients, who visited the Dental Hospital of Tokyo Medical and Dental University for new complete dentures, were recruited. Oral examination was performed. Cawood and Howell's method was used to grade the mandibular ridge form. The stability and retention of the mandibular complete denture were assessed using Kapur method. Accuracy of jaw relation recording was evaluated using a newly developed jaw relation index. Patients' perception of chewing ability was rated using a food intake questionnaire. Patients' satisfaction with complete dentures was assessed on a 100-mm visual analogue scale. OHRQoL was measured using the Japanese version of the Oral Health Impact Profile for edentulous subjects. A structural equation model was constructed based on the hypothesis that oral condition and denture quality would be related to chewing ability, satisfaction and OHRQoL.

*Results:* Significant relationships were found between mandibular ridge form, stability of mandibular complete denture, accuracy of jaw relation recording, perceived chewing ability, satisfaction and OHRQoL. Various fit indices were within acceptable limits.

*Conclusions:* Oral condition and denture quality were related to patients' perception of chewing ability, satisfaction with dentures and OHRQoL in complete denture wearers.

*Clinical significance:* A favourable oral condition and denture quality are important for successful complete denture therapy.



## 1. Introduction

Over the years, there has been a decline in the proportion of edentulous patients in developed countries. However, due to ageing of the society, the need for edentulous treatment will not decrease.[1] Recently, placement of mandibular two-implant overdentures (2-IOD) has been suggested as a treatment option in edentulous patients.[2] The 2-IOD treatment may result in better oral health-related quality of life

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(OHRQoL) compared to conventional complete denture therapy. Nevertheless, all edentulous patients cannot benefit from 2-IOD treatment owing to socioeconomic background.[3] Therefore, it is becoming increasingly important to determine the predictors for conventional complete denture therapy.

A large number of studies on the success of conventional complete denture therapy have dealt with factors such as patients' age, demographics, personality, previous denture wearing experience, expectations, attitudes, residual ridge form, anatomy, method of construction, denture quality, changes over time, aesthetics, and dentist–patient relations. However, the evidence base of this area suffers from a lack of well-conducted studies.[4,5]

Most studies on successful conventional complete denture therapy employed bivariate analysis, analysis of variance or multiple regression analysis; hence, true causal relations could not be clearly defined. Structural equation modelling (SEM) is a strong multivariate analytical method that can express direct and indirect effects separately, and show complex relations visually by using a path diagram. In a study on patients' satisfaction with new complete dentures using SEM, Fenlon and Sherriff suggested that there were relationships between mandibular ridge condition, stability and retention of new mandibular complete denture, accuracy of jaw relation recording, patients' adaptability, and patients' satisfaction with new complete dentures.[6] However, OHRQoL and perceived chewing ability were not used as variables in the study.

Regarding the relationship between perceived chewing ability and quality of life (QoL) in elderly people, Koshino et al. detected a statistically significant correlation between mastication score calculated using a food intake questionnaire in edentulous patients with complete dentures and QoL score which proved to be valid and reliable.[7] Fueki et al. also found that perceived chewing ability was a critical factor for OHRQoL in patients with removable partial dentures using SEM.[8]

The Oral Health Impact Profile (OHIP) is a questionnaire on OHRQoL that comprises 49 items, and has been used as an effective means for comparing prosthodontic outcomes.[9] It has been translated into various languages.[10–13] A simpler and shorter version of the OHIP (OHIP-14) has been created.[14–17] However, OHIP-14 could not detect improvements following clinical intervention in edentulous patients because of the floor effect. Therefore, the OHIP-EDENT was developed, which comprises 19 items targeting edentulous patients. OHIP-EDENT could detect OHRQoL changes in edentulous patients with clinical intervention.[18–20] In this study, OHIP-EDENT-J was used.[21]

The following hypotheses were tested in the present study: the mandibular ridge form and stability and retention of mandibular complete denture are related to accuracy of jaw relation recording; stability and retention of mandibular complete denture and accuracy of jaw relation recording are related to patients' perception of chewing ability; mandibular ridge form, accuracy of jaw relation recording and patients' perception of chewing ability are related to patients' satisfaction with complete dentures and; patients' perception of chewing ability and patients' satisfaction are related to OHRQoL. Cawood and Howell's method[22] was used to grade mandibular ridge form. Stability and retention of mandibular complete denture were estimated according to Kapur method.[23] Patients' perception of chewing ability was rated using a food intake questionnaire.[24,25] OHRQoL was measured using OHIP-EDENT-J.

The aim of this paper was to investigate the relationship between mandibular ridge form, stability and retention of mandibular complete denture, accuracy of jaw relation recording, patients' perception of chewing ability, patients' satisfaction with complete dentures and OHRQoL using SEM.

## 2. Materials and methods

### 2.1. Subjects

The study population consisted of systemically healthy patients who attended the Dental Hospital of Tokyo Medical and Dental University, from December 2008 to July 2011, requesting new complete dentures. One hundred and eighty-three patients (82 men and 101 women) with a mean age of 74.6 (range, 44–91; SD: 9.6) years participated in this study. Data from subjects with missing scores were excluded from all analyses. Consequently, data of 166 patients (77 men and 89 women) with a mean age of 75.1 (range, 44–91; SD: 9.2) years were analysed in this study. Scores were missing due to the following reasons: nine patients did not have a mandibular denture or dentures; six patients were absent before measurements; and two patients had to stay in hospital before measurements. Oral examination was conducted by one examiner. The examiners were calibrated prosthodontists with more than 4 years of clinical experience in the Prosthodontic Clinic at the Dental Hospital of Tokyo Medical and Dental University. All subjects gave written informed consent. The experimental procedures were approved by the Ethics Committee of Tokyo Medical and Dental University.

### 2.2. Mandibular ridge form

Cawood and Howell's method[22] was used to assess the mandibular ridge form. This method classifies edentulous ridges into five categories: Class II, immediately post extraction; Class III, high well rounded ridge form; Class IV, knife edge ridge form; Class V, flat ridge form; Class VI, depressed ridge form. The mandibular ridge form was rated using a 5-point scale and the mandibular ridge form score was obtained.

### 2.3. Stability and retention of mandibular complete denture

Stability and retention of mandibular complete denture were estimated using the Kapur method.[23] Stability was assessed using a 3-point scale, and retention using a 4-point scale.

### 2.4. Accuracy of jaw relation recording

Regarding the jaw relation, we examined whether there was correct intercuspation without premature contact.[26] Furthermore, convergence of the tapping point was estimated by using a gothic arch tracer. We recorded the jaw relation index, which combined the estimation of jaw relation and